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# KENT-MOORE

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## J 38522

# VEHICLE SIGNAL GENERATOR INSTRUCTIONS

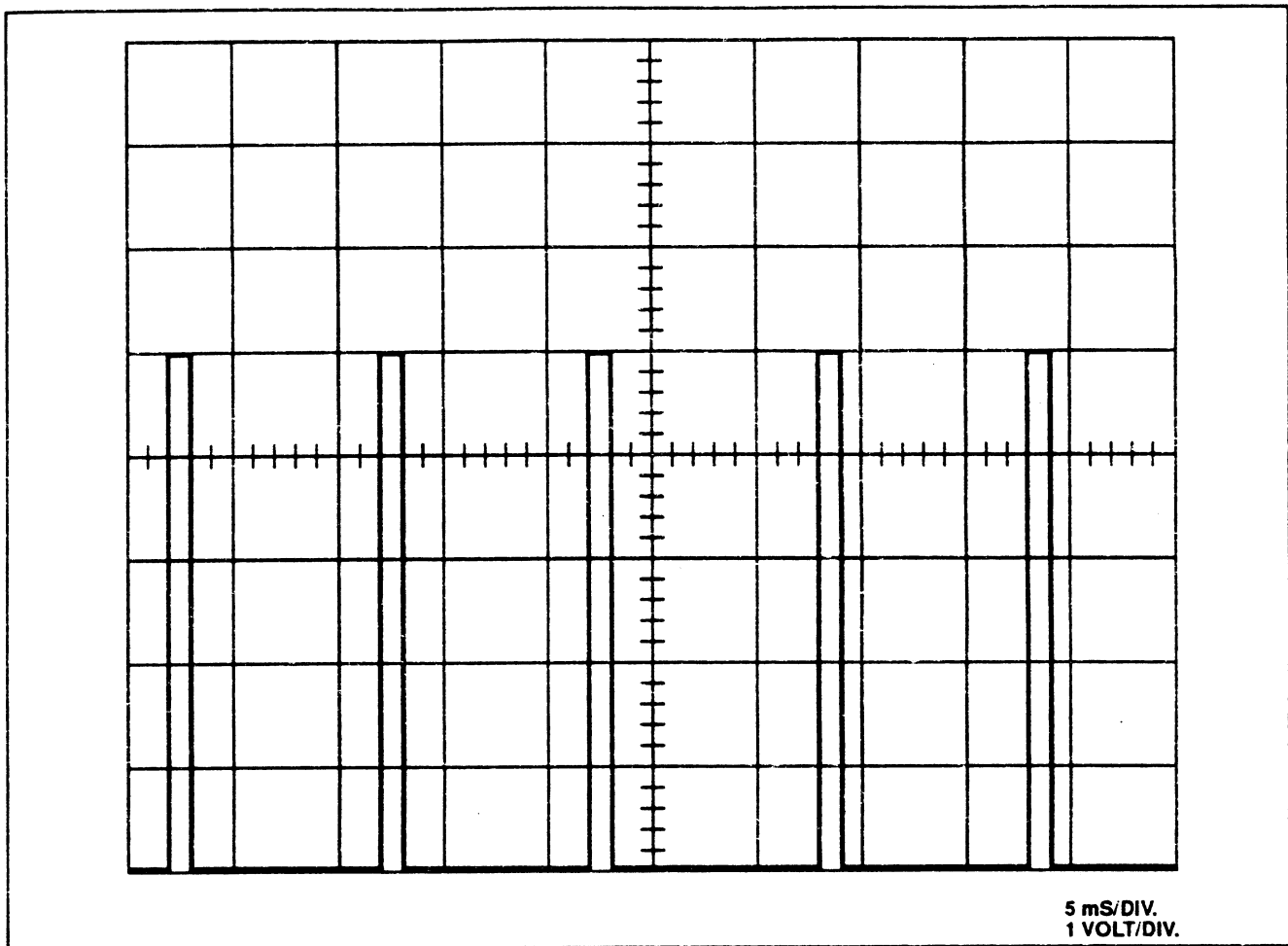
### (J 38522) FREQUENCY SELECTION

With the output of digital circuits changing constantly and increasing in frequency, a variable frequency signal generator was needed in today's rapidly changing industry. The problem with a variable generator is knowing what frequency the user is generating without the use of a frequency counter. The answer is quite simple: use 9 common predetermined selectable frequencies that are pre-set and identified on a rotary selector switch.

### (J 38522) DUTY CYCLE

Any selected frequency can be changed by the use of a duty cycle selector position rotary switch from 10 to 90 percent. The duty cycle percentage represents the **ON** time, or the time the **RED** test lead is outputting a **LOGIC HIGH** state. The output signal has three different selectable voltage levels: 5, 8 or 12 volts. Refer to Figure 3-1.





**FIG. 3-1**  
**DUTY CYCLE AT 10 PERCENT/5 VOLTS.**

**(J-38522) AC WAVEFORM**

The signal selector switch also has an AC waveform position which allows 30 Volts (P-P) at 30 Hertz and up to 30 Volts (P-P) at the 10 Kilo-Hertz position. This position is used when an AC signal needs to be substituted such as a vehicle speed sensor/generator or an ignition pole piece. The duty position selection switch does not change the AC waveform output, only frequency selection will change the AC signal.

A "**SIGNAL OUT**" LED is tied to the output signal, which is illuminated as an indicator that the signal generator is working.

## **(J 38522) FUNCTIONAL DESCRIPTION**

### **A. INPUTS**

User input is by setting of three rotary switches

1. Output signal form - four settings
  - a.) 30 Volt P-P sine wave
  - b.) 5 Volt square wave
  - c.) 8 Volt square wave
  - d.) 12 Volt square wave
2. Output signal frequency - nine settings
  - a.) 30 Hz.
  - b.) 60 Hz.
  - c.) 120 Hz.
  - d.) 250 Hz.
  - e.) 300 Hz.
  - f.) 600 Hz.
  - g.) 1 KHz.
  - h.) 5 KHz.
  - i.) 10 KHz.
3. Square wave output duty cycle - nine settings
  - a.) 10 %
  - b.) 20 %
  - c.) 30 %
  - d.) 40 %
  - e.) 50 %
  - f.) 60 %
  - g.) 70 %
  - h.) 80 %
  - i.) 90 %

### **B. OUTPUTS**

1. Light indicating unit operation when unit is operating normally
2. Signal determined by switch settings

## **ELECTRICAL**

### **A. OPERATING VOLTAGE RANGE - 10 TO 15 Volts DC**

1. REVERSE POLARITY PROTECTION - to supply voltages
2. TRANSIENT PROTECTION - to 60 Volt Peak 100 millisecond duration pulse

### **B. OUTPUT**

1. SINE WAVE  
Plus & minus 15 Volts, 30 Volts Peak to Peak +/- 10%
2. SQUARE WAVE
  - a.) Negative lead reference
  - b.) Positive 5 Volts +/- 10 %
  - c.) Positive 8 Volts +/- 10 %
  - d.) Positive 12 Volts +/- 10 %
3. DUTY CYCLE - +/- 1% (i.e. 9 TO 11% @ 10% SETTING)
4. FREQUENCY - output frequency within +/- 2% of setting
5. IMPEDANCE - supply 20 milliamps @ rated output voltage

### **C. CONNECTORS**

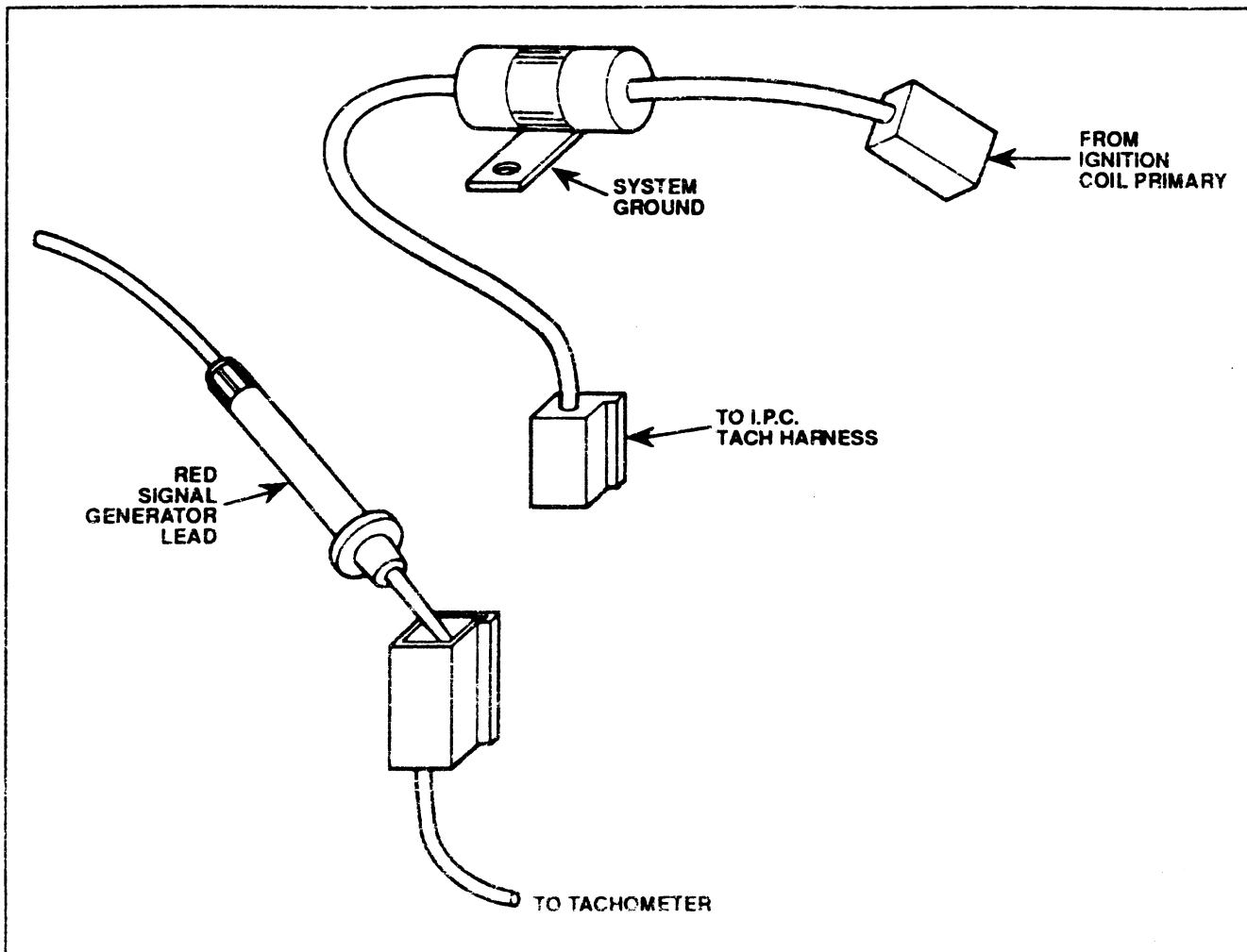
1. POWER - Cigarette plug
2. OUTPUT - Banana jack
  - a.) signal positive - red
  - b.) signal reference - black

### **D. CABLES**

1. POWER - 8 foot long 16 awg HPN

## CHECKING IGNITION MODULE FUNCTIONS: HEI TACHOMETER SUBSTITUTION

When substituting a tachometer signal, use the AC output selection on distributor engines and the 5 volt DC pulse on distributorless engines. Distributor engines use a Tach Filter so it will be necessary to use the filtered side of the Tach Filter to probe the Signal Generator leads. The filtered side of the Tach Filter can physically be located on the vehicle by turning the ignition and using a 12 volt test light connected to ground, backprobe the Tach Filter connector. One lead should light the test light, the other lead should not light the test light. Connect the signal generator red lead to the connector that did not light the test light. Connect the black test lead to system ground. Turn signal generator to the 30 Hz. position and turn the ignition switch "ON". Refer to Figure 3-2 for correct connections.



**FIG. 3-2**  
**TACH FILTER CONNECTION**

4 CYL.		6 CYL.		8 CYL.	
RPM	TACH FREQUENCY	RPM	TACH FREQUENCY	RPM	TACH FREQUENCY
500	16.66667	500	25	500	33.33333
550	18.33333		27.5	550	36.66667
600	20	550	30	600	40
650	21.66667		32.5	650	43.33333
700	23.33334	600	35	700	46.66667
750	25		37.5	750	50
800	26.66667	650	40	800	53.33333
850	28.33334		42.5	850	56.66667
900	30	700	45	900	60
950	31.66667		47.5	950	63.33333
1000	33.33333	750	50	1000	66.66666
1050	35		52.5	1050	70
1100	36.66667	800	55	1100	73.33334
1150	38.33333		57.5	1150	76.66666
1200	40	850	60	1200	80
1250	41.66667	900	62.5	1250	83.33334
1300	43.33333		65	1300	86.66666
1350	45	950	67.5	1350	90
1400	46.66667	1000	70	1400	93.33334
1450	48.33333		72.5	1450	96.66666
1500	50	1050	75	1500	100
1550	51.66667		77.5	1550	103.3333
1600	53.33333	1100	80	1600	106.6667
1650	55		82.5	1650	110
1700	56.66667	1150	85	1700	113.3333
1750	58.33333	1200	87.5	1750	116.6667
1800	60	1250	90	1800	120
1850	61.66667		92.5	1850	123.3333
1900	63.33333	1300	95	1900	126.6667
1950	65		97.5	1950	130
2000	66.66666	1350	100	2000	133.3333
2050	68.33334		102.5	2050	136.6667
2100	70	1400	105	2100	140
2150	71.66666		107.5	2150	143.3333
2200	73.33334	1450	110	2200	146.6667
2250	75		112.5	2250	150
2300	76.66666	1500	115	2300	153.3333
2350	78.33334		117.5	2350	156.6667
2400	80	1550	120	2400	160
2450	81.66666		122.5	2450	163.3333
2500	83.33334	1600	125	2500	166.6667
2550	85		127.5	2550	170
2600	86.66666	1650	130	2600	173.3333
2650	88.33334		132.5	2650	176.6667
2700	90	1700	135	2700	180
2750	91.66666		137.5	2750	183.3333
2800	93.33334	1750	140	2800	186.6667
2850	95		142.5	2850	190
2900	96.66666	1800	145	2900	193.3333
2950	98.33334		147.5	2950	196.6667
3000	100	1850	150	3000	200

**FIG. 3-3**  
**TACH FREQUENCY vs RPM CHART**

### **NO RPM DISPLAY CUSTOMER COMMENT**

If no RPM is displayed on the I.P. Tachometer using the signal generator, make sure the fuse powering up the tachometer circuitry is good. Substituting a known good signal will quickly help make the decision whether the instrument panel has to come apart or not.

## **POLE PIECE SUBSTITUTION (NO SPARK CONDITION)**

The **POLE PIECE** can be substituted by selecting the 30 volt AC signal ( P-P ) without having to disconnect it from the ignition module. The red lead should be backprobed into the connector green lead and the black lead backprobed into the connector white lead. Select the 30 Hz. frequency. Connect a **ST-125 SPARK PLUG TESTER** to the coil secondary output wire and ground the side clip of the **ST-125**. If the engine is fuel injected, disconnect the injector harness from all injectors so as not to flood the cylinders with fuel. Turn the ignition "ON" and note the **ST-125** tester for spark. If spark now occurs, the pole piece connection or the pole piece is at fault. If no spark occurs, and battery voltage is available at the module, then the module is at fault. The quickest way in this case was to test the module in place without disturbing the components and their connections.

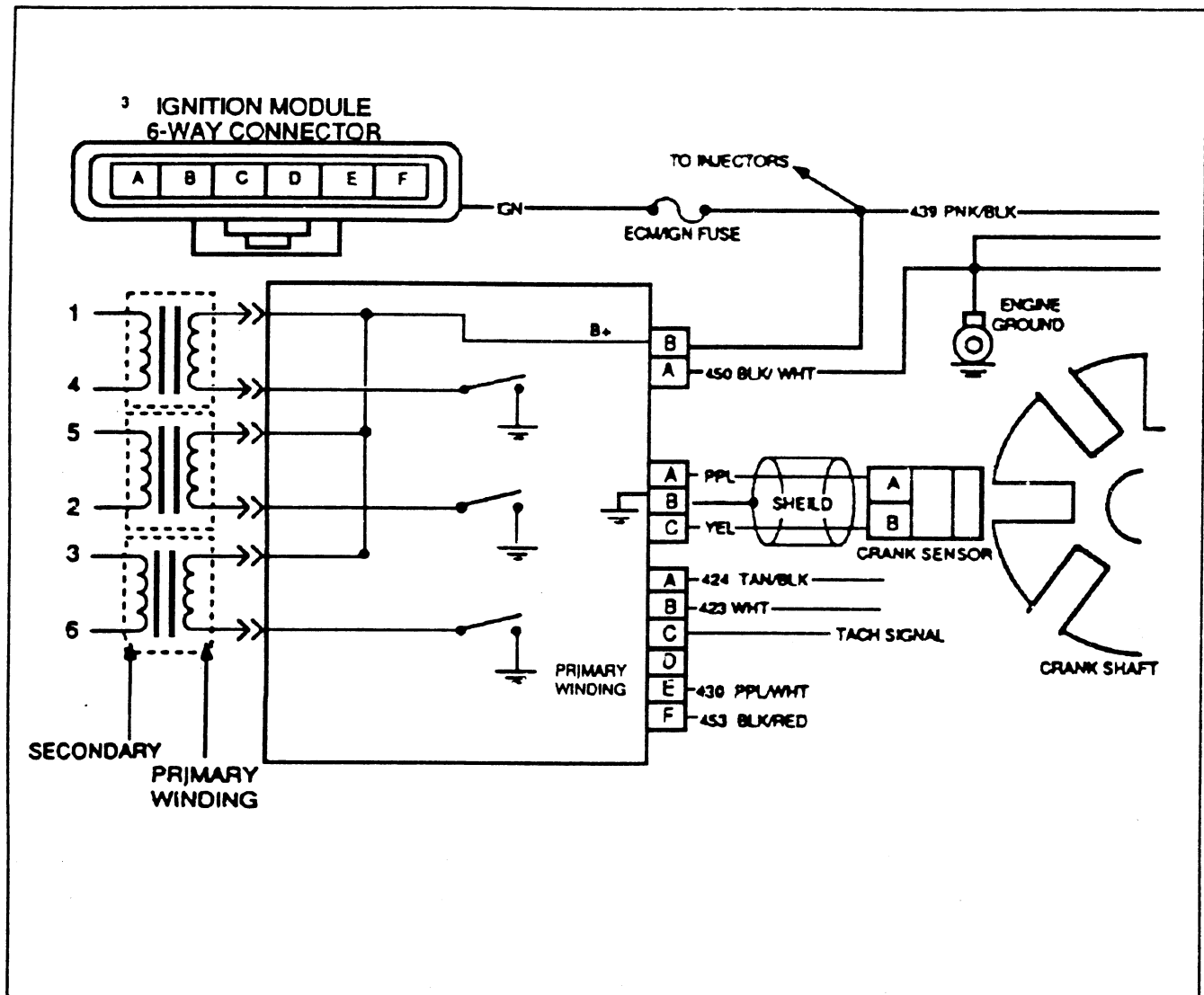
## **DISTRIBUTOR REFERENCE SIGNAL**

Whenever the distributor reference signal is being substituted (**CIRCUIT 430**) an injector **NOID** light should be used in place of the injector so as to provide an easy visual means that the injector driver is working properly and excessive fuel will not wash down the cylinder walls. In cases where the injectors cannot easily be reached for disconnecting, look to see if there is another injector connector in series that can be reached. Move the **NOID** light to that connector and make the necessary connections to check injector driver(s).

## **DIS TACHOMETER OUTPUT**

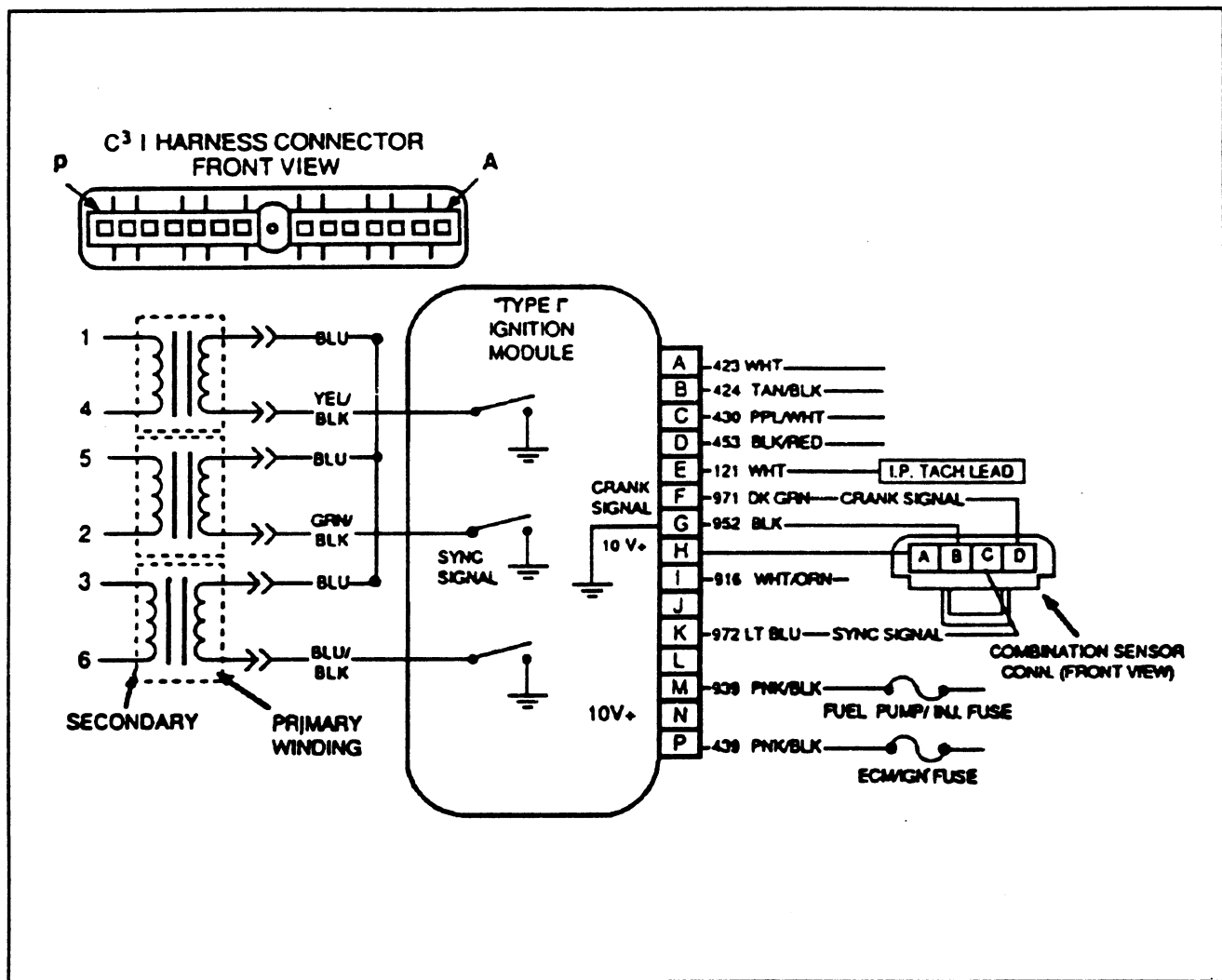
On distributorless (DIS) applications the Tach Filter is built into the ignition module. The output is normally a 5 or 8 volt square waveform and is identified as **CIRCUIT 121**.

The signal generator can be hooked up by disconnecting the ignition harness at the ignition module and connecting the red lead of the signal generator to the harness end using a Micropak 150 Series Male Terminal End. The black lead should be connected to the vehicle system ground. Select either the 5 volt or the 8 volt square wave position and start at 30 Hz. frequency. The 50 percent duty position should be selected. Turn "ON" the ignition switch, engine "OFF," and note the I/P Tachometer display. If no RPM is displayed as per the chart in Fig. 3-3, follow the diagnostic procedures from Section 8A under the heading of "**INSTRUMENT PANEL CLUSTER**" or "**DISPLAYS**," normally found in Cell 82. Figures 3-4 through 3-7 illustrate some of the DIS Tachometer output locations.



**FIG. 3-4**  
**2.8L/3.1L/3.4L IGNITION MODULES**





**FIG. 3-5**  
**3800 IGNITION MODULE**



## 2.3L "QUAD 4" ENGINE

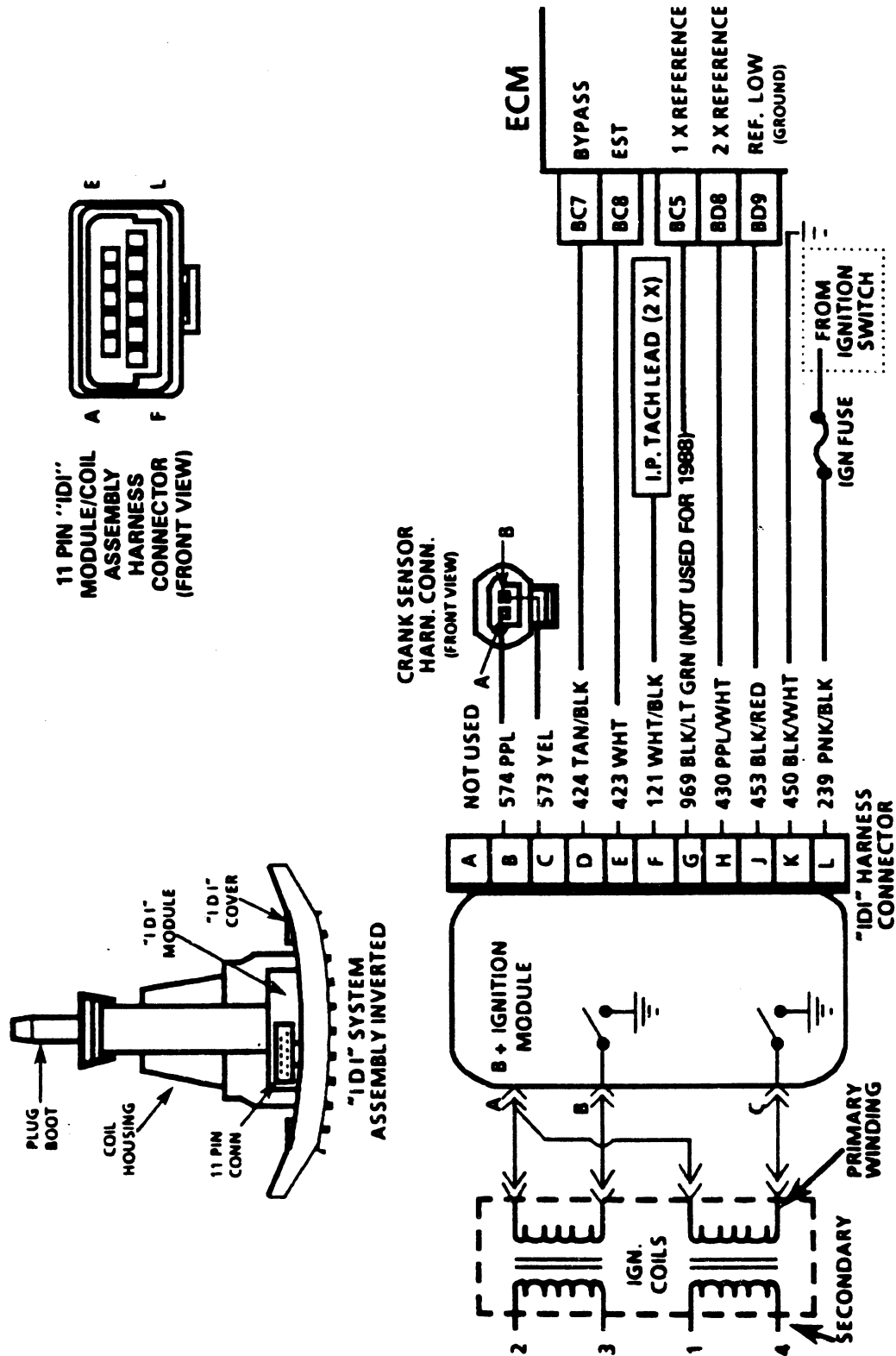













FIG. 3-7  
2.3L IGNITION MODULE

The Hall Effect crankshaft and camshaft sensors from the DIS systems can all be substituted. It is much simpler dialing in a known generated value than swapping parts with another car or the parts department. The following Figures 3-8 through 3-12 illustrate the scope patterns of the various engine ignition modules, some which can be substituted with the signal generator J38522. The synch pulse generated by the crankshaft odd spacing cannot be substituted.

# **IGN. MODULE**

PIN	OSCILLOSCOPE SIGNAL	VOLTAGE	TYPE OF SIGNAL
A		0 volts	Syst. Ground
B	 	14.3 volts (key ON) 0 volts (key OFF)	Battery Voltage
A		0 volts	PN Sensor/Input
B		0 volts	Shield
C		0 volts	PN Sensor/Input
A		5 volts (run) 0 volts (crank)	EST Bypass/Input
B		5 volts 1 volt 0 volts	EST Signal/Input
C		5 volts 0 volts	Tach Signal/Output
D	NOT USED		
E		5 volts (high) 0 volts (low)	Crank Reference/Output
F		0 volts	Logic Ground

**FIG. 3-8**  
**2.0L/2.5L/2.8L/3.1L/3.4L**  
**IGNITION SCOPE PATTERNS**

## 2.3L QUAD 4 ENGINE IGN. MODULE










PIN	OSCILLOSCOPE SIGNAL	VOLTAGE	TYPE OF SIGNAL
A	NOT USED		
B		0 volts	PN Sensor/Input
C		0 volts	PN Sensor/Input
D		5 volts (run) 0 volts (crank)	EST Bypass/Input
E		5 volts 1 volt 0 volts	EST Signal/Input
F		8 volts 0 volts	Tach/Input
G	NOT USED		
H		5 volts 0 volts	Crank Reference/Output
J		0 volts	Crank Reference (Logic Low)
K		0 volts	Syst. Ground
L		14.3 volts (key ON)	Voltage Feed

FIG. 3-9  
2.3L IGNITION SCOPE PATTERNS

### 3.0L IGN. MODULE












PIN	OSCILLOSCOPE SIGNAL	VOLTAGE	TYPE OF SIGNAL
A		5 volts (run) 1 volt (crank) 0 volts	EST Signal/Input
B		5 volts (run) 0 volts (crank)	EST Bypass/Input
C		5 volts 0 volts	Crank Reference/Output
D		0 volts	Crank Reference/Low Output
E		8 volts (run) 0 volts (crank)	Tach Lead/Output
F		7.1 volts 0 volts	Crank Sensor/Input
G		0 volts	Crank Sensor Ground
H		12 volts	Crank Sensor Voltage Supply/Output
I	OPEN		
J	OPEN		
K		7.1 volts 0 volts	Cam Sensor/Input
M		14.3 volts (key ON) 0 volts (key OFF)	Battery Voltage Feed
N		14.3 volts (key ON) 0 volts (key OFF)	Battery Voltage Feed

FIG. 3-10  
3.0L IGNITION SCOPE PATTERNS

### 3.8L IGN. MODULE


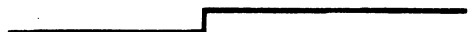












PIN	OSCILLOSCOPE SIGNAL	VOLTAGE	TYPE OF SIGNAL
A		5 volts (run) 1 volt (crank) 0 volts	EST Signal/Input
B		5 volts (run) 0 volts (crank)	EST Bypass/Input
C		5 volts 0 volts	Crank Reference (High)/Output
D		8 volts 0 volts	Tach Lead/Output
E		7.1 volts 0 volts	Crank Signal/Output to ECM
F		0 volts	Reference Low (Logic)
G		7 volts 0 volts	Crank Signal/Input
H		12 volts 0 volts	Crank Sensor Ground
J		10 volts 0 volts	Crank Sensor Voltage
K		0 volts	Cam Sensor Ground
L		7 volts 0 volts	Cam Sensor Signal/Input
M		10 volts 0 volts	Voltage Supply to Cam Sensor
N		14.3 volts (key ON) 0 volts (key OFF)	Module Supply Voltage
O	NOT USED		
P		14.3 volts (key ON) 0 volts (key OFF)	Module Supply Voltage

FIG. 3-11

### 3.8L IGNITION SCOPE PATTERNS



# **"3800" ENGINE IGN. MODULE**

PIN	OSCILLOSCOPE SIGNAL	VOLTAGE	TYPE OF SIGNAL
A		4 volts (run) 1 volt (crank) 0 volts	EST/Input
B		5 volts (run) 0 volts (crank) 0 volts	Bypass/Input
C		11 volts 0 volts	Buffered Crank 18X/Output
D		11 volts 0 volts	Buffered Crank 3X/Output
E		6 volts 0 volts	Tachometer/Output
F		11 volts 0 volts	Buffered Cam/Output
G		9.5 volts 0 volts	Crank I/Input
H		9.5 volts 0 volts	Crank II/Input
J		9.5 volts	Cam/Input
K	NOT USED		
L		0 volts	Reference Low (Logic)
M		0 volts	Sensor Ground
N		10 volts 0 volts	Sensor Supply Voltage
O		14.3 volts 0 volts	Module Supply Voltage
P		14.3 volts (key ON) 0 volts (key OFF)	Module Supply Voltage

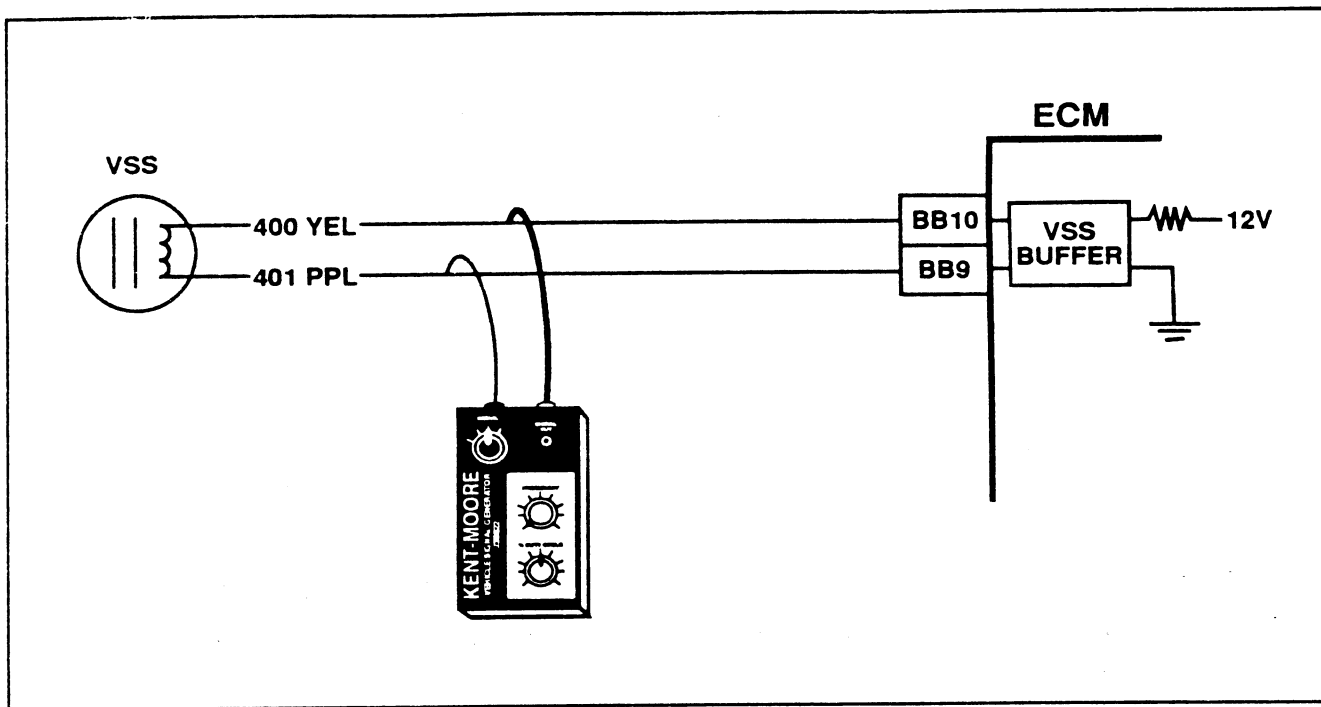
**FIG. 3-12**  
**3800 IGNITION SCOPE PATTERNS**

## **CRUISE CONTROL**

In many cases the circuit does not have to be disturbed to send a signal to test a device if the connector does not have weather protective seals. If the ignition is switched "ON" to power up a device such as an electronic cruise control module, the signal generator can be placed at the harness connector at the signal generator end (if equipped) or used at the cruise control connector by backprobing.

### **PROCEDURES**

1. Engine Off: Disconnect the cruise control servo link at the servo end so the servo is not connected to the throttle linkage.
2. Connect the red lead and black leads to the VSS generator harness. Refer to Figure 3-2 for installation. The polarity of leads to harness leads does not matter.



**FIG. 3-13**  
**CRUISE CONTROL APPLICATION**

3. Power up signal generator and select 30 Hz. frequency and the AC waveform on the signal rotary switch; 30 Volts (P-P). Turn the ignition switch to the "ON" position and turn on the cruise control switch; tap the **SET** button. Note the servo pulling back. **Servo will only pull back if the vacuum reservoir is charged.** If the reservoir is not charged, run the engine at idle for 30 seconds, and then turn the engine "OFF." Now turn the ignition "ON" and reset the **ENGAGE** button. The servo should hold steady. If the servo vacuum solenoid has to keep pulsing, there is a leak in the vacuum check valve, hose or servo itself.

## SPEEDOMETER DIAGNOSIS

When checking speedometer circuits using the signal generator, start by disconnecting the electrical harness connector at the vehicle speed generator. This would be performed when a customer has a Code 24 in memory and the Speedometer/Odometer is inoperative. The cruise control should also not work, indicating a problem lying between the VSS generator and the VSS buffer. **REMEMBER**, the fuse should be the first thing to check before going into in-depth diagnosis. Whatever diagnostic chart you are following that requires a VSS signal, always start with the 30 Hz. scale and work to higher numbers. Most all speedometers will give a display by the time you select 120 Hz. If no speedo displays, then the I/P will have to be accessed for further diagnosis. If the speedometer now displays using the signal generator, then the problem lies with the VSS generator or its connection had too high resistance with the harness connector.

The difference in the number of Reluctor teeth on the VSS generator indicates the number of pulses the VSS generates per revolution. There are many versions since the Pontiac Fiero and the Corvette introduced the VSS generator in 1984. The only common thing with the VSS generators and speedo cables is the number of revolutions per mile are all the same: **1001 REVOLUTIONS!** This is the standard of the domestic industry.

## ABS SENSOR SUBSTITUTION

When checking **ABS SENSORS** the **SIGNAL GENERATOR** can substitute the voltage normally generated by the **WHEEL SENSOR**. The Sensor cannot be checked using the Signal Generator, but with a **DVOM** as per the **SHOP MANUAL** in Section **5E-1**. Nominal **Sensor Resistance** of a **WHEEL SPEED SENSOR** IS **800 TO 1400 OHMS**.

**ALWAYS CHECK** for a grounded harness before continuing. The **Signal Generator** signal should be placed on the 30 Volt A/C (P-P) position and 30 Hz. frequency. The signal, if the circuit and **EBCM** are working properly, can be read by using the **TECH-1** and its optional **BRAKE CARTRIDGE**. If the Ignition is switched "ON" with the generator connected to a **ABS WHEEL SENSOR HARNESS**, a MPH indication should display.

If the **TECH-1** does not display a MPH reading from a particular wheel sensor harness, install the appropriate **Pin-Out Box** and connect the **SIGNAL GENERATOR** to the effected harness pins using the electrical schematic from **SECTION 5E-1** of the **Shop Manual**.

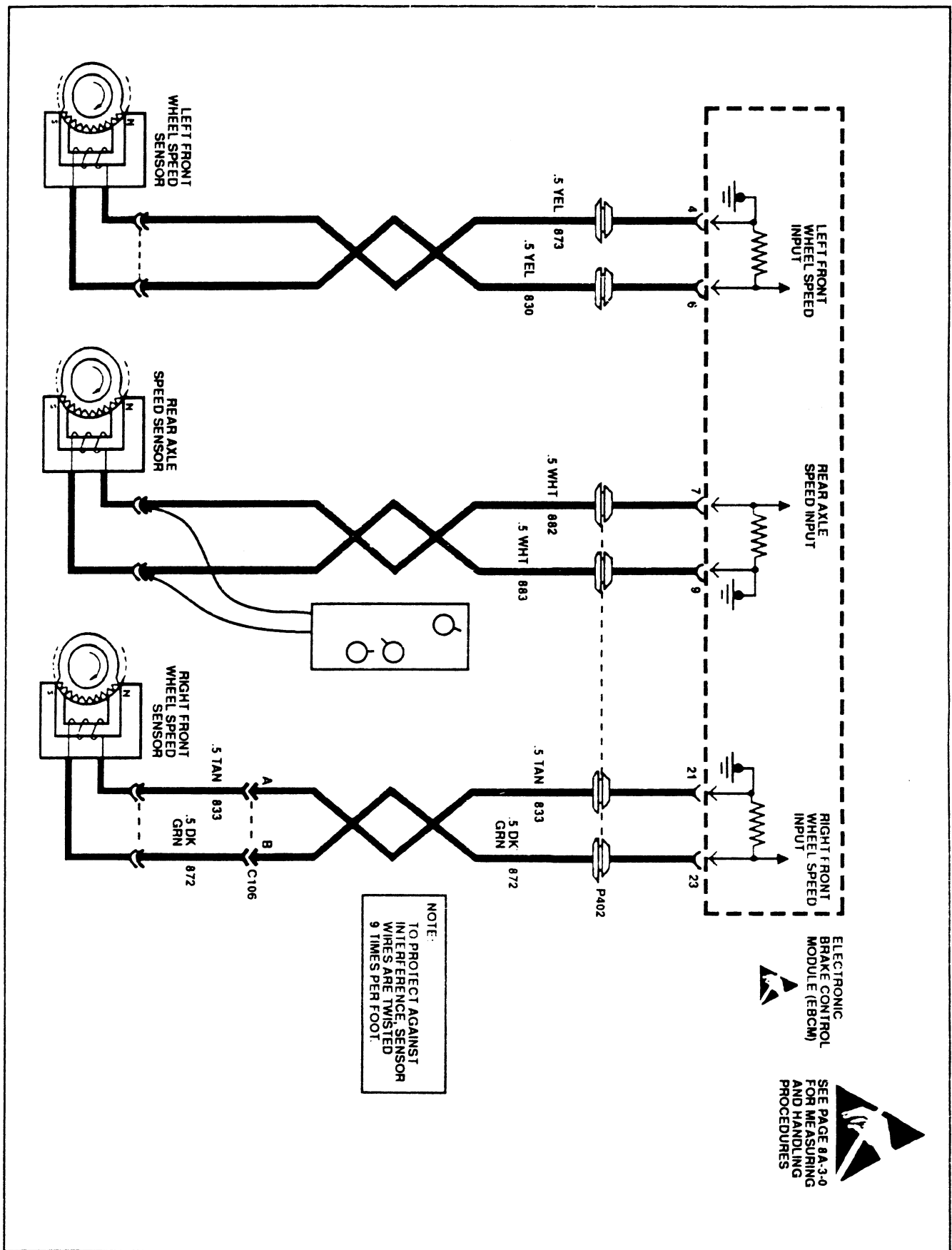


FIG. 3-14  
ABS SCHEMATIC AND SIGNAL GENERATOR

## **Signal Generator Possible Uses**

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### **Square Wave**

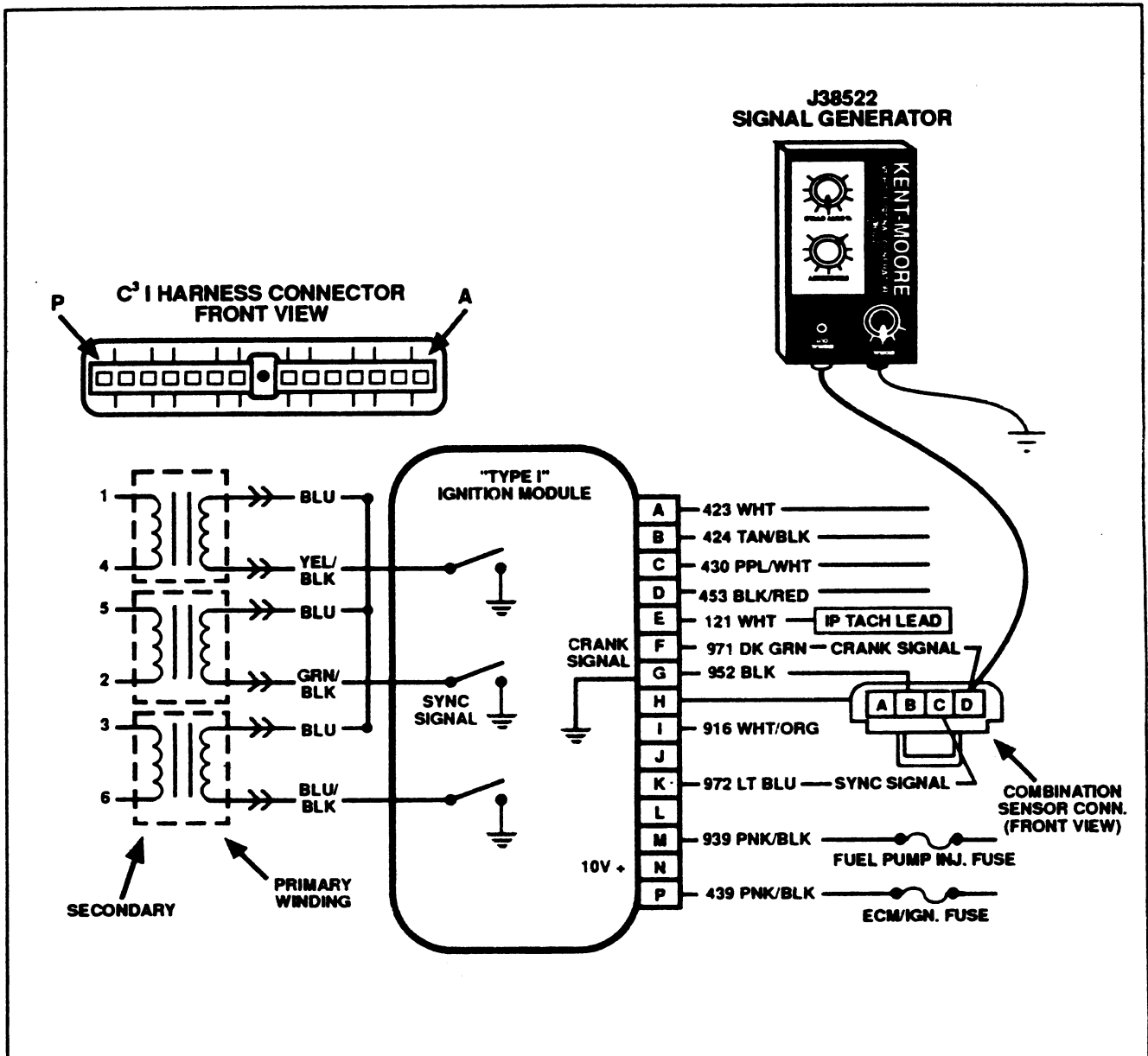
- Ignition Module
- HEI, DIS, C31
- EST
- MAF
- VATs
- VF Dimming
- Wastegate Solenoid
- VSS
- EGR
- Canister Purge
- Cruise Module
- Dual Cooling Fans
- Blower Mtr. Controllers
- O2 Sensor

### **Sine Wave**

- Wheel Speed Sensors
- VSS
- SPS (Sawtooth)
- O2
- MAP
- ESC

## HALL EFFECT SENSOR SUBSTITUTIONS

Most **Hall Effect** switch signals fall into three voltage level applications on GM Vehicle Applications. They are typically 0 to 5 Volts, 0 to 8 Volts or 0 to 12 Volts. The **Signal Generator** rotary switch at the top left has the 3 voltage level positions to generate a substitute **Hall Effect Switch Signal**. When substituting a **Hall Effect** with the **Signal Generator**, make sure the signal line is not grounded or held **LO** by a defective **Hall Switch**. Refer to Figure 3-15.



**FIG. 3-15**  
**SIGNAL GENERATOR USED IN**  
**HALL EFFECT APPLICATION**

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